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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

OILSEEDS AND FATS AND OILS: DIFFERENCES BETWEEN EARLY-SEASON AND FINAL ESTIMATES OF SUPPLY AND DEMAND FACTORS USED IN MAKING OUTLOOK FORECASTS [1]

by

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SUMMARY

Forecasts of production of oilseeds by the Crop Reporting Board first begin in July with the forecast of flaxseed production. These forecasts are based on estimated acreage and the condition of the crop or the probable yield expected by producers on the first of the month, and assume average weather, disease, and insect conditions for the remainder of the growing season. Forecasts then are issued in successive months through harvest, and a preliminary estimate of production is issued in December.

In the August report on soybean production, for example, the Crop Reporting Board reports the production that is expected as of August 1. Many unpredictable factors, such as hail, excessive rain, and drought, during later months may cause final production to differ from what is expected as of that date. Naturally, no account can be taken of these unknown random events and the best assumption to make is that conditions during the remainder of the season will be average. The economic analyst, as of August 1, wants the best estimate of the crop based on what is known thus far in the marketing season. Assuming no consistent statistical bias in the forecasts, the best indication of actual production as of that date is the figure contained in the report released by the Crop Reporting Board. At the same time, however, the economic analyst wants some idea of the reliability of these forecasts.

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[1] The research on which this report is based was carried on under authority of the Agricultural Marketing Act of 1946 (RMA, Title II). Summaries of the report were published in the July and September 1955 issues of The Fats and Oils Situation, FOS-173 and 174.
This is second in a series of studies to be summarized in applicable Situation reports during coming months giving information of this type. A report covering wheat, rye, and rice, AMS-38, can be obtained by writing the Division of Marketing Information, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

Agriculture-Washington
AMS-63

February 1956

He has an interest in knowing the degree of association that has prevailed in the past between the August forecast and the final outturn. This gives him a measure of the probable usefulness of the August figure as an indication of the actual production. Stated in another way, he wishes to know what proportion of the factors that affect final production are known, on the average, by August 1, and therefore are reflected in the forecast of the Crop Reporting Board, and what proportion are unknown and hence may affect the final outturn during the remainder of the season. This report is concerned with providing measures of this type, both for the estimates of the Board and for certain other factors that are taken as given in price analysis work.

For oilseeds, no significant statistical bias in the early-season forecasts was found. As would be expected, differences between early-season and final figures for oilseeds, on the average, diminish steadily as the season advances (Fig. 1). Year-to-year indications based on monthly forecasts are closely associated with year-to-year changes in December estimates for all oilseeds once harvesting of the respective crops has begun.

The marketing year commonly used for all fats and oils begins in October. For the entire marketing year, forecasts of probable changes in the level of overall demand factors from the preceding year available in October explain between 85 and 90 percent of the actual variation.

Forecasts of production of fats and oils as such appear in certain issues of The Fats and Oils Situation. Analyses of data available for only a few years suggest that in October about 50 percent of the year-to-year variation in production for the marketing year can be forecast for total edible vegetable oils. For total drying oils, this figure is around 85 percent, and for lard, over 95 percent. The early-season estimates for butter and soap fats are not as close.

This analysis indicates that insofar as supply and overall demand factors affect prices of fats and oils during the marketing year, errors in forecasting prices in October arise chiefly from two sources: (1) Converting production data of the oilseeds into an accurate indication of production of fats and oils and (2) forecasting production of butter and soap fats. Problems involved in making estimates of this sort are discussed on p. 18. In specific years, other factors, such as changes in export policy or price support policy, may have important effects on the level of prices, and errors may arise because of the impossibility of having advance knowledge of such administrative actions.

By January, production of butter and edible vegetable oils for the entire marketing year can be forecast much more accurately than in October. But even by January, forecasts of production of major groups of fats and oils are less accurate as an indication of year-to-year changes than are the forecasts for overall demand factors or the estimates of production of specific crops.

Too few data are available on forecasts for overall demand factors or for production of fats and oils to check on statistical bias.

Background of Study

Analysis of future trends in prices is an important part of situation and outlook work. Such studies frequently are made considerably in advance of harvest as a guide to producers and handlers in planning their operations during the marketing season; they are brought up-to-date as the marketing season progresses. The reliability of these analyses depends on (1) knowledge of the basic relationships that prevail between prices and certain "causal" variables, such as supply and general business conditions, and (2) the agreement of the early-season estimates of these causal factors with later or final estimates. Armore 2/ showed that during the period covered by the years 1922-42 and 1947-51, 92 percent of the variation in prices of edible fats and oils was associated with variations in the supply of these fats and oils, supply of lard, and the level of disposable personal income. Similar analyses are not available for industrial or total fats and oils, but it is likely that basic supply and demand variables of this sort account for a substantial part of the variation in prices. Supplies and prices of competing commodities, supply and demand in foreign outlets, and numerous other factors are also important. In recent years, Government support programs and other governmental actions also have had important effects on the level of prices.

The research project discussed here is a first step in measuring factors that affect the reliability of early-season estimates of future price trends. It is designed to measure in a systematic way relationships between early-season forecasts of domestic supply and demand variables and the final figures. Related research that deals with season-average prices also is described. One problem in connection with an analysis of this kind is that forecasts of causal factors used in preparing situation and outlook reports frequently are not systematically recorded. Of necessity, analyses reported here are confined to those factors for which forecasts have been recorded. They include forecasts and estimates of production and season-average prices for oilseeds, peanuts, and tung nuts made by the Crop Reporting Board, forecasts of production of fats and oils published regularly in The Fats and Oils Situation, and forecasts of trends in general business conditions issued for use within the United States Department of Agriculture by the Farm Income Branch of the Agricultural Marketing Service. Of the latter, 2 series have been analyzed--personal disposable income and industrial production. As noted in the preceding paragraph, Armore found that disposable income is an

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2/ Armore, Sidney J. The Demand and Price Structure for Food Fats and Oils. U. S. Dept. Agr. Tech. Bul. 1068, pp. 28-33, 56-58. 1953.

important factor affecting prices of food fats and oils. Armore and Burtis [3] showed that industrial production is an important factor affecting consumption of all fats and oils, excluding butter. It can be presumed that it has some effect on prices of industrial fats and oils.

The discussion in this report is divided into the following sections: (1) Factors of demand, (2) production forecasts for oilseeds, (3) production forecasts for peanuts, (4) production forecasts for tung nuts, (5) production forecasts for fats and oils, and (6) estimates of season-average prices. Historical series for the several items were compiled with the cooperation of members of the staffs of the agencies that initially prepare them. These staff members also assisted in planning this study and in reviewing the results.

Factors of Demand

Each fall and spring the Farm Income Branch of the Agricultural Marketing Service prepares forecasts of the principal series that relate to overall economic conditions for about a year ahead. These forecasts are intended for use by commodity analysts and other research workers within the Agricultural Economics Division who prepare outlook and situation reports. A record of these forecasts from 1948 to the present time is available on ditto sheets and discussions of them are found in the files of The Demand and Price Situation, in which such discussions are carried regularly. Estimates of industrial production by months are prepared by the Federal Reserve Board; estimates of disposable income by quarters are prepared by the Department of Commerce. Each of the series is published in the Survey of Current Business; revisions of income data appear in February and July. Subsequent revisions are made from time to time as new series and new methods are developed. These frequently result in moderate changes in level for all or part of the series. Because of these changes in level and irregularity in timing of the revisions, forecasts of the series have been compared with the first revision issued after the date of forecast. In all cases, forecasts and revised estimates are computed from the same base. As is noted in subsequent paragraphs, this procedure is similar to the way in which comparisons are made for forecasts of production published by the Crop Reporting Board.

For some studies of future trends in prices, emphasis is placed on the average level during the marketing year; for other studies, it is placed on the level during shorter time periods, such as fall or spring. As an indication of the accuracy of the forecasts of general economic conditions in relation to these two types of studies, two sorts of comparisons were made: (1) Differences between forecasts of the season-average (or calendar year) level of the factor and the revised figure for the marketing (or calendar) year and (2) differences between the forecast for a specific quarter and the revised quarterly figure. As all of the general economic series are adjusted for normal seasonal variation, the 4 quarters within the year need not be distinguished one from another in an analysis of this sort.

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[3] Armore, Sidney J., and Burtis, Edgar L. Factors Affecting Consumption of Fats and Oils Other Than Butter, in the United States. Agr. Econ. Research, 2:1-9, illus. 1950.

Because of the short period for which recorded forecasts are available, these analyses are less reliable as indicators of the exact degree of difference between the early-season forecasts and the revised estimates than are those based on forecasts made by the Crop Reporting Board. For this reason, results are not shown in tabular form and the discussion in the following paragraphs is given in general rather than specific terms. Data for 1950 are excluded from these analyses because the outbreak of the Korean conflict was an unpredictable and abnormal disturbance.

Disposable Income.--Forecasts of disposable income are usually made by quarters for about a year ahead. Thus analyses can be made by calendar year, by marketing year, and by individual quarters. The fall forecast of disposable income, usually made in October, can be regarded as an early-season forecast when figures are compiled on a marketing-year basis. As discussed on p. 11, one way to study the relationships between early-season forecasts and final or revised estimates is in terms of the percentage of associated variation in the two series. Because of the few years for which forecasts are available, this approach only was used; analyses in each case are based on year-to-year changes in the estimates associated with forecast changes from the preceding year.

In terms of a marketing-year average, between 85 and 90 percent of the variation in year-to-year changes in the revised estimate was associated with the fall forecast, and almost 98 percent with the spring forecast, issued approximately 6 months later. Timing of the forecast in relation to the estimate is somewhat different when working with calendar-year averages. Nevertheless, between 85 and 90 percent of the variation in the revised estimate is associated with the forecast issued in the preceding fall, about 95 percent with the forecast issued in spring, and almost 98 percent with the forecast issued in the current fall.

In analyzing data by quarters, no distinction was made between forecasts issued in fall or spring. Instead, the forecasts were classified as those made 1 quarter in advance, those made 2 quarters in advance, and so on. As of the date of forecast, data would not be issued for the current quarter, so that in effect this represents a forecast on the part of the analyst and is classified as being made 1 quarter in advance. The percentage of variation in year-to-year changes in revised estimates associated with the forecast change from the preceding year was more than 99 percent for those forecasts made 1 quarter in advance, approximately 90 percent for those made 2 quarters in advance, and about 80 percent for forecasts made 3 and 4 quarters in advance. When the method described on p. 13 is used to translate these percentages into the percentage of the time that the correct direction of change is forecast, a figure of over 80 percent is given for forecasts made 1 through 4 quarters in advance.

Industrial production.--Currently, forecasts for industrial production are given only on a calendar-year basis. Results indicate that about 70 percent of the year-to-year variation in the revised calendar-year estimate is associated with the forecast in the preceding fall, approximately 80 percent with the forecast issued in spring, and more than 99 percent with the forecast issued in the current fall.

When year-to-year variation of the final estimates of disposable income and industrial production for the period 1930-54 is examined, an average of about 8 and 14 percent, respectively, is indicated. Year-to-year variation, percentagewise, was about the same for these two demand factors for 1949-54 as for 1930-54. This suggests that year-to-year variation in the shorter period used to study forecasts is typical of that found in a longer period.

Acreage and Production Forecasts for Oilseeds

In this section, material is presented that relates to differences between the early-season forecasts and the final estimates of acreage and production of soybeans, flaxseed, and cotton. 4/ Cotton was included because production of cottonseed varies directly with that of cotton. Such data as are issued on production of cottonseed also are analyzed.

Data on Acreage and Production.--The Crop Reporting Board 5/ issues reports on farmers' planting intentions as of March 1 for most crops in March. For oilseeds, these early-season estimates of acreage intentions are the first indications of possible changes in production. Later estimates that relate to acreage alone are not used in this study for those months in which a forecast of production is published.

In the early years of crop reporting, acreage intentions were not uniformly issued in the same form as now. Since 1936, however, these intention figures have been consistently reported on a planted acreage basis for most crops. Planted acreages also are reported in December for these crops. To insure valid conclusions, analyses for flaxseed and soybeans that involve data on acreage intentions begin with 1936 or 1937.

4/ The analyses for cotton supplement studies published by Lowenstein, Frank. Variations in Crop Forecasts for Cotton, Jour. Farm Econ. 36:674-680. 1954.

5/ Crop forecasts appear in Crop Production, a monthly publication issued by the Crop Reporting Board, U. S. Department of Agriculture, Washington, D. C. Data on cotton also are reported individually by the Crop Reporting Board in Cotton Production.

The first report for cotton is an estimate of acreage in cultivation on July 1. A final estimate of such acreage is released in the following May. A benchmark revision of acreage in cultivation was published in 1933 on all data for years prior to that date. But unrevised data are available back to 1915 and are used in this study.

In using data on intentions to plant or on acreage in cultivation as a guide to possible changes in production for flaxseed and cotton, respectively, for a current year, a comparison can be made with the reported figure for the preceding year for either planted or harvested acreage. That is, in a regression analysis designed to estimate changes in production from indicated changes in acreage, the independent variable could be either the intended acreage minus (1) the planted acreage in the preceding year or (2) the harvested acreage in the preceding year. Analyses of each kind were made in this study. Contrary to what might be expected on first thought, use of the harvested acreage for the previous year usually provides the more reliable guide.

The first forecast of the production of soybeans for harvest as beans is published by the Crop Reporting Board in August; such forecasts are issued monthly thereafter through November. For flaxseed, monthly forecasts of production are made from July through October. In each case, monthly forecasts are based on the condition or probable yield reported by crop reporters on the first of the month and assume average weather, disease, and insect conditions for the rest of the growing season. A preliminary estimate of production for the year is issued in December; a revised estimate is published in the annual summary report for the December following. A further revision, based on census benchmark data published every 5 years, is made for these crops as soon as possible after census data become available. In this report we refer to the several sets of estimates here described, respectively, as "preliminary December," "revised December," and "final" figures.

Forecasts of the production of cotton lint are published from August through December, at which time ginnings account for practically the entire crop. The Bureau of the Census and the Crop Reporting Board publish a final production estimate concurrently in May, following completion of harvest. Thus, for cotton, the so-called "revised" and "final" figures are identical. A single cottonseed production estimate is given when the final May revision of the cotton lint crop is published. An indication of cottonseed production is included in the tables of the December cotton report, based on the December estimate of cotton production and the average ratio of lint to cottonseed for the preceding 5 years. Similar indications are given in the text of cotton reports beginning in August of each year.

Relationships between early-season and final figures can be considered from a number of viewpoints. Three viewpoints are considered here:
(1) Standard deviations of differences, in terms of million bushels or million bales, between early-season and final production estimates, (2) percentage

of variation in year-to-year changes in December estimates associated with year-to-year changes in indications based on monthly forecasts, and (3) percentage of the time that monthly forecasts indicate the correct direction of change from the preceding year in the final estimate.

Differences Between Early-Season and Final Production Estimates.--Results of the analyses on production of oilseeds are first presented in terms of the relative magnitude of the difference between early-season and final estimates by using standard deviations expressed in physical units. Standard deviations, for normal distributions, measure the scatter or dispersion about an average such that the average plus or minus one standard deviation ordinarily includes about two-thirds of the observations. Since the long-time average of the forecasts for any month is normally approximately the same as the average of the final estimates, the average difference, taking the signs into account, between early-season and final estimates approximates zero. In computing standard deviations, the square of the difference between each observation and its average is used, so that in effect the sign of the difference is ignored. Since the average difference approximates zero, the size of the standard deviation directly indicates the size of the difference between the estimate of the crop and any given monthly forecast within the period under study.

Because of variation in weather conditions and losses that may result from disease and insects during the remainder of the season, the first forecast, on the average, varies most from the December figure. For example, a forecast of the soybean crop in August was first published in 1942. The simple average of the difference, without regard to direction, between the August forecast of production and the estimate of the crop published in December was 17 million bushels for the period 1942-54. In 8 out of these 13 years, or approximately two-thirds of the time, the difference was equal to or less than 18 million bushels; and the computed standard deviation is 18 million bushels. Relations of this sort generally hold. For the September forecast, the standard deviation drops to 13 million bushels. A decline to 8 million bushels takes place for the October forecast, and to 5 million bushels for November (Fig. 1).

A change in method of obtaining reports from farmers took place when the rural mail carrier survey was started in 1924. 6/ As this survey was designed to improve the accuracy of the forecasts, certain analyses begin with 1925. Other periods were analyzed for specific crops. These were periods in which the month of publication of the initial forecast of production changed,

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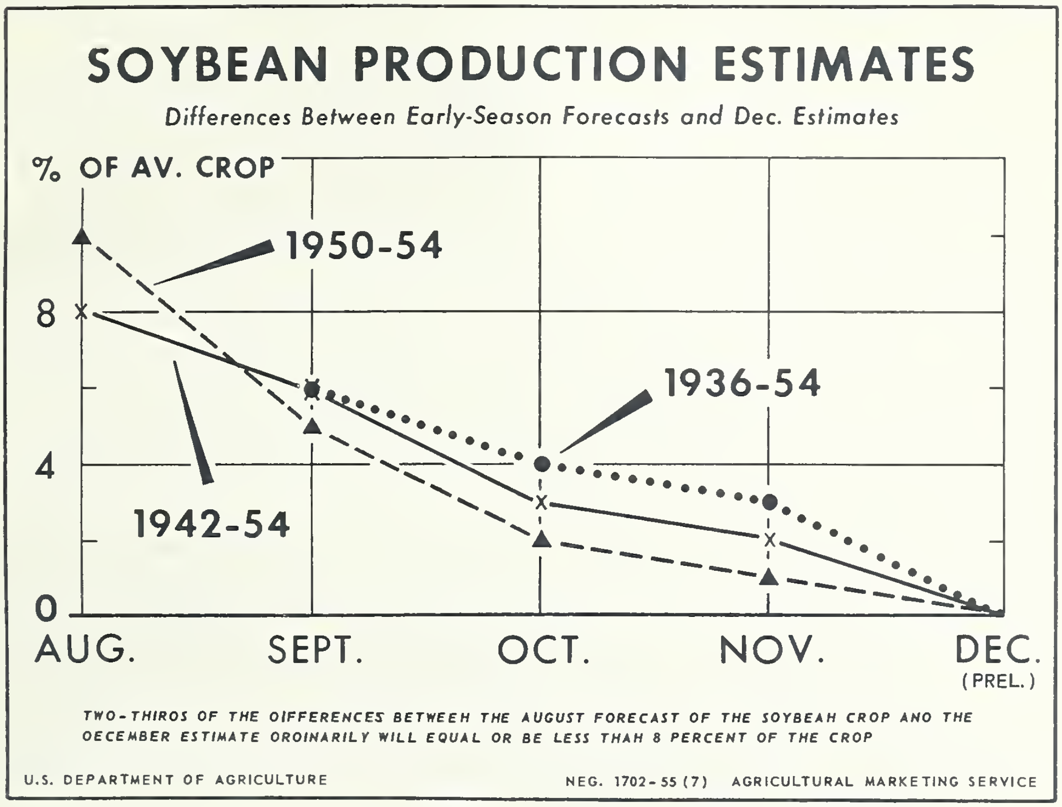
6/ Rural mail carriers distribute about 600,000 questionnaire cards to individual farmers along their routes three times each year--in June and December for livestock and in October for crop acreages planted and harvested. About 160,000 cards or approximately 25 percent normally are returned and tabulated.



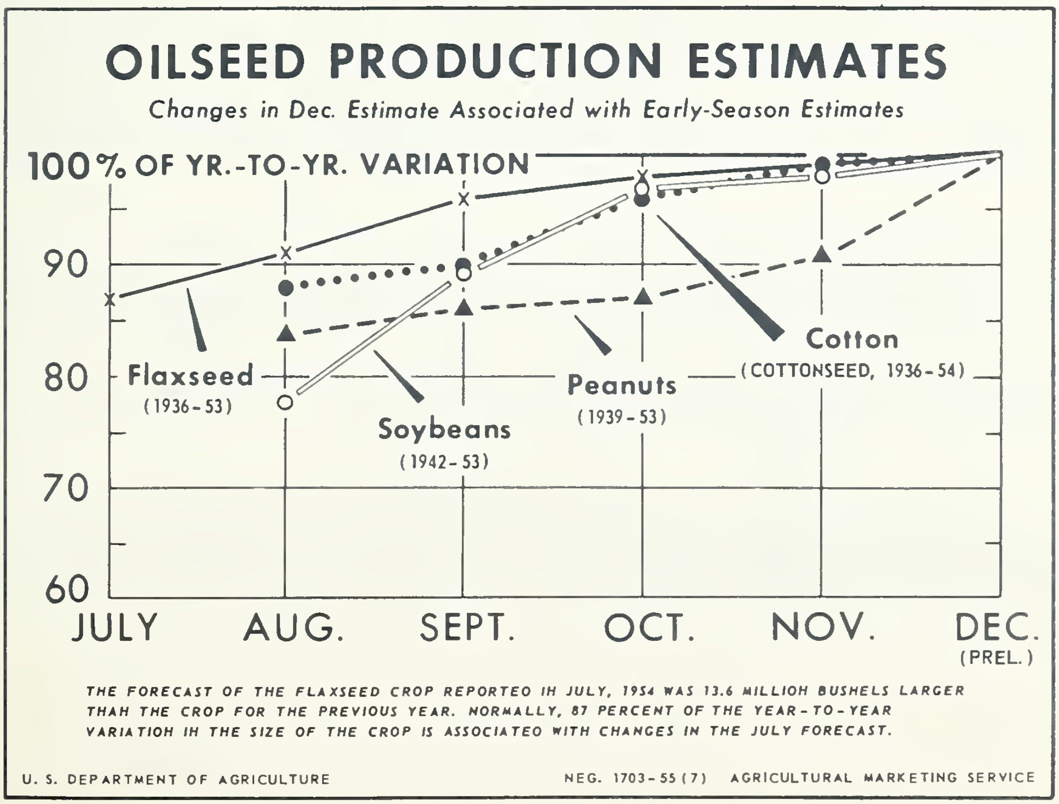
SOYBEAN PRODUCTION ESTIMATES

Differences Between Early-Season Forecasts and Dec. Estimates

TWO-THIRDS OF THE DIFFERENCES BETWEEN THE AUGUST FORECAST OF THE SOYBEAN CROP AND THE DECEMBER ESTIMATE ORDINARILY WILL EQUAL OR BE LESS THAN 8 PERCENT OF THE CROP

U.S. DEPARTMENT OF AGRICULTURE NEG. 1702-55 (7) AGRICULTURAL MARKETING SERVICE

Figure 1



OILSEED PRODUCTION ESTIMATES

Changes in Dec. Estimate Associated with Early-Season Estimates

THE FORECAST OF THE FLAXSEED CROP REPORTED IN JULY, 1954 WAS 13.6 MILLION BUSHELS LARGER THAN THE CROP FOR THE PREVIOUS YEAR. NORMALLY, 87 PERCENT OF THE YEAR-TO-YEAR VARIATION IN THE SIZE OF THE CROP IS ASSOCIATED WITH CHANGES IN THE JULY FORECAST.

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Figure 2

and the period for which the new forecast was available was enough different from one beginning with 1925 to indicate the possibility of having a statistically-significant effect on the analysis.

For soybeans, five periods are analyzed--1929-54, 1936-54, 1939-54, 1942-54, and 1950-54. No forecast was issued before 1929. For the years 1929-32, forecasts first were issued in the November report. Beginning with 1933, forecasts first were published in the September report. However, the period used in the analysis was 1936-54, so as to be consistent with analyses on acreage intentions. (See p. 6.) Forecasts for the country as a whole for years before 1939 were based on forecasts for major States only. To measure possible effects of the omission of data for minor States, analyses were made for 1939-54. Beginning in 1942, forecasts first were published in the August report. The period 1950-54 was analyzed separately; production of soybeans in 1950-54 was considerably larger than that of any previous period. As figure 1 indicates, in terms of percentage of the actual average crop, standard deviations for the periods 1936-54, 1942-54, and 1950-54 follow essentially the same pattern. When expressed in actual physical units, however, standard deviations for 1950-54 are larger than those based on longer periods, perhaps reflecting the larger crops harvested. The period 1929-54 is not shown on the chart because data are limited to an estimate for one month only. Patterns as a percentage of the crop for 1936-54 and 1939-54 are identical; therefore, only the former period is shown. These standard deviations are based on differences between the early forecast and the preliminary December estimate. Hence they drop to zero in December. As indicated in table 1, adjustments in the estimates are made in the December following, and again when census data become available.

Table 1 shows standard deviations of the differences between specified forecasts and the preliminary December estimate for each of the crops included in this study for specified periods. Taking any one period studied, the standard deviations for the successive monthly forecasts are largest in the early part of the crop year, then decline gradually to zero in December. Shown also in table 1 is the percentage that each standard deviation represents of the average crop during the same years.

The last line of each section of table 1 shows standard deviations of year-to-year changes in production for the respective periods for each crop. These computations are based on production estimates made after census data become available. Standard deviations of differences between early-season forecasts and the preliminary December estimate for cotton and the oilseeds are smaller than standard deviations of year-to-year changes in production for all months of forecast.

Differences between the preliminary December and revised estimates chiefly reflect information obtained on the volume of marketings, data from State assessors, and other check data. For flaxseed and cotton, these changes are small relative to year-to-year variations in production. For soybeans, however, the standard deviation of this difference was almost 30 percent as large as the standard deviation of the year-to-year change. These differences between crops reflect chiefly the fact that harvesting and marketing for most of the flaxseed and cotton crops are completed before December, but a substantial part of the soybean crop is marketed after this date. With the exception of cotton lint, further revisions are made after data from the quinquennial Censuses of Agriculture become available. These are minor for all crops.

Percentage of Year-to-Year Changes in Production Predicted by Early-Season Forecasts.--Another way to study the usefulness of the early-season production forecasts in connection with price or utilization forecasts is in terms of the percentage of variation in year-to-year changes in production that can be forecast by making use of them. Emphasis is placed on year-to-year changes because the use in the analysis of the change between one year and the next tends to reduce the effect of trends that may cover up or distort the underlying relationships. Outlook reports are chiefly in these terms.

These analyses can best be described by considering a specific example. If the indicated change in production in 1955 from that in the preceding year is computed from the August crop report, the computation is made by subtracting the figure relating to the crop of 1954, published in December 1954, from the forecast for 1955. In the terminology used in this report, the preliminary December estimate for the preceding year is subtracted from the forecast for the current year. In December 1955, a similar computation is made by subtracting the revised figure for 1954 from the estimate for 1955. In the terminology used here, the revised December estimate for 1954 is subtracted from the preliminary December estimate for 1955. In the studies discussed in this part of the report, correlation analyses were run using the forecast change from the preceding year as the independent variable and the change from the preceding year indicated by the December report as the dependent variable. 7/ The square of the correlation coefficient, called the coefficient of determination, represents the percentage of variation in the dependent variable associated with variations in the independent variable. Thus, the coefficient of determination for August represents the percentage of variation in year-to-year changes in production that can be forecast by making use of the data published in the August report.

These percentages for representative periods for the various crops are shown in table 2 and summarized in figure 2, using a consistent time period to the extent possible.

A somewhat different method is needed to evaluate the usefulness of intentions to plant or of early-season forecasts of acreage as an estimate of production for months before the first forecast of production. One of the

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7/ Revised figures published in the cotton report for the following May were used in the case of cotton.

purposes of the intentions report is to provide a basis for farmers to change their acreage plans if this appears desirable after they learn of plans of farmers in general. Moreover, other factors, either climatic or economic, that develop after submitting intention estimates may cause farmers to change their plans. For example, the July 1955 Fats and Oils Situation indicated that plantings for the flaxseed crop were 8 percent below March intentions. Lowering of the support price for the 1955 crop announced after release of the March intentions report is considered a major factor in this change. Intentions data, however, frequently are used by economic analysts as a first indication of possible changes in production.

The March report on plantings includes a figure on intended acreage for flaxseed. Intentions for soybeans also are shown but specifically represent acreage "grown alone for all purposes." In the report for cotton published in July before harvest, only a figure on acreage in cultivation on July 1 is given. Economic analysts, in using data of this sort, generally multiply the acreage figures by an average yield to obtain an indication of possible production, and sometimes allow for average abandonment. When used in correlation analyses based on year-to-year changes, however, it makes practically no difference whether the analysis is based on the computed production or on the acreage as such, as an average used in one year is almost the same as that used for the following year. Two sets of analyses based on acreage data were made, using as the dependent variable in each case year-to-year changes in production. In one, the preliminary estimate of planted acreage for the preceding year, as indicated in the December crop report, is subtracted from the "in cultivation" or "intended" acreage figure to obtain the independent variable in the analyses reported in this study. Poor relationships were found, on the average, for soybeans based on data in the intentions report; however, this does not preclude the possibility that unusually large changes in intended acreage would have a significant effect on production in a given year. For flaxseed, however, 70 percent of the variation in the two series is associated, and for cotton, 59 to 76 percent, depending on the period used. The second set of analyses was made only for flaxseed and cotton. In these, the independent variable was obtained by subtracting the preliminary estimate of harvested acreage for the preceding year from the early intentions and "in cultivation" figures, respectively. Estimates computed in this way were associated with a larger percentage of the year-to-year variation in production than were estimates obtained by making use of data on planted acreage for the preceding year (table 2).

The figures in table 2 move in the reverse direction from those on standard deviations as the dates of forecast approach the date of harvest. Based on data for 1942-53, only 78 percent of the year-to-year variation in production of soybeans is associated on the average with indications based on the August forecast; but this percentage increases to 89 for the September forecast, 97 for October, and 98 for November. Based on data for 1936-53 for flaxseed, indications based on the forecasts in July are associated with 87 percent of the year-to-year changes in production, and from September on, with more than 95 percent of this variation. Using data for 1936-54 for cotton lint, indications based on the August forecast are associated with 88 percent [8] of the year-to-year variation in the preliminary December production estimate, and this increases to over 96 percent for October and to more than 99 percent for November.

Percentage adjustments as a proportion of normal year-to-year changes after the preliminary December estimate have been 5 percent or less, on the average, for all oilseeds. Year-to-year variation in the revised estimates for all crops are associated with more than 99 percent of the year-to-year changes in the final figures, indicating that benchmark revisions normally are relatively minor for these crops.

For cottonseed, the December indication of production based on the normal relationship of yield of lint to yield of seed is associated with more than 99 percent of the variation in the official estimate published in the following May.

Early-Season Estimates as Indicators of the Direction of Change in Production.- Frequently, farmers and members of the trade are more interested in accurate estimates of direction of change in production from one year to the next than in magnitude of change, although both are important in analyzing future trends for prices or other economic variables. A formula derived by mathematical statistics indicates that the probability that a forecast will indicate the correct direction of change in the preliminary December estimate depends directly on the size of the correlations discussed in the preceding section. [9] In computing this mathematical probability, a bivariate (two-way) normal distribution is assumed, whereas the distribution for production estimates of most crops is known to be skewed. Also, as shown in footnote 9, the formula calls for the value of the correlation based on all possible data; but a value based on a sample of years was of necessity used. For these and other reasons, actual percentages are expected to differ from the estimated percentages. In those cases for which the formula is approximately applicable, use of the formula gives more consistent comparisons than does an actual count for the years included in the analysis.

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[8] Lowenstein (op. cit.) reports a percentage of variation of 84 percent in the period 1915-52 for this relationship.

[9] The probability of like signs for the forecast and actual change from the preceding year equals $\frac{2}{\pi} \tan^{-1} \sqrt{\frac{1 + \rho}{1 - \rho}}$, where ρ is the population value of the correlation between the forecast and actual changes.

Probabilities were computed, based on the formula, using the correlations between specified variables. These are shown in table 3. Results are listed for the longest periods studied for each crop. For flaxseed, for instance, the March changes in acreage intentions indicate correct changes so far as direction is concerned in the estimate of December production in 82 percent of the years; from the formula, this indication would be expected to show correct changes 82 to 84 percent of the time. Estimates of acreage in cultivation on July 1 for cotton indicate the correct direction of change in production from 79 to 84 percent of the time (depending on whether harvested or planted acreage for the preceding year is used) as compared with expected percentages based on the formula of 84-85 percent. Relationships between the actual and expected results are equally close for those crops when correlations pertaining to production forecasts are used. On the other hand, poor comparisons are noted for soybeans up to the November forecast of production, perhaps as a result of the expanding production during the period studied. This suggests that the formula should not be used when working with data for soybeans.

Using results from the formula, indications for cotton and flaxseed based on early-season data normally indicate the correct direction of change in production from the preceding year more than 80 percent of the time in all cases. Based on a direct count for 1942-53 for soybeans, early-season data do not indicate the correct direction in 80 percent or more of the years until the October production forecast. It is possible that the early-season estimates will become more accurate as indicators of direction of change in actual production once the rapid expansion in this crop ceases.

Results of a Test for Statistical Bias.--Most analysts use production forecasts as the best indication of the probable size of a crop. This procedure is valid only when the regression coefficient between the crop and the forecast, or between the change in the crop and the change in the forecast, does not differ significantly from 1, and the constant value in the equation does not differ significantly from zero. The regression coefficients for flaxseed range from 0.97 to 1.02; for soybeans, from 0.98 to 1.09; and for cotton, from 0.90 to 1.00, and the constants all are close to zero. The usual Student's t-test for statistical significance was made and it was found that for most forecasts these coefficients do not differ significantly from the above criteria. Hence, there appears to be no significant statistical bias in these forecasts.

Acreage and Production Forecasts for Peanuts

Data and methods of analysis for peanuts are similar to those for the oilseeds. Discussion in this section includes only aspects that differ from those of the oilseeds.

Acreage intentions data relate to acreage grown alone for all purposes. The first forecast of production of peanuts picked and threshed is issued in August; such forecasts are issued monthly thereafter through November. As with the oilseeds, a preliminary estimate of production for the year is issued in December. But this estimate is revised in the following July. The revision is based primarily on check data from processing plants. Data published in the following December and those published in July are nearly identical in most years. Minor benchmark revisions subsequently are made.

Standard deviations of differences between specified forecasts and the preliminary December estimate for peanuts, as well as the oilseeds, are shown in table 1. As for the other crops, these are largest in the early part of the crop year, after which they decline gradually to zero.

Differences between the preliminary December and revised estimates chiefly reflect information obtained on the volume of peanuts processed and other check data. The standard deviation of this difference is about 40 percent as large as the standard deviation of the year-to-year change in production. The sizeable revision that takes place following the preliminary December estimate reflects the fact that a substantial part of the peanut crop is marketed after December 1.

Acreage intentions data for peanuts are a poor indicator of probable changes in production (table 2). This reflects, in part, the fact that the intentions data relate to acreage grown alone for all purposes, whereas a considerable part of the crop is harvested for hay or is "hogged off." Other reasons for the low degree of relationship are the same as those discussed for oilseeds on page 12.

For 1939-43, 84 percent of the year-to-year variation in production of peanuts picked and threshed was associated with indications based on the August forecast, and this increased to 91 percent for the November forecast. For a more recent period, 1944-53, the degree of association was not as close. The lower percentage of associated variation for 1944-53 is believed to reflect the effect of Government programs initiated in the early 1940's to stimulate the expansion of the peanut crop, particularly in new areas, and in later years, to reflect aspects of the price support program that permitted the planting of land in excess of the acreage allotment to peanuts for crushing.

Examination of the data led to a choice of the 1931-41 period as one typical of normal changes between early-season forecasts and estimates made at the end of the year. The percentage of year-to-year variation in production associated with early-season forecasts for each month in 1931-41 was larger than those for comparable months in 1944-53. Of the variation in the December estimate of peanuts picked and threshed, 68 percent for the 1944-53 analysis was associated with indications based on the September forecast, 71 percent for October, and 86 percent for November. Using data for 1931-41, percentages for these months range between 91 and 96 percent. Beginning with the 1954 crop, conditions are expected more nearly to resemble those in the pre-World War II period. For example, in 1954 actual changes were consistent with those that would be expected from an analysis based on data for 1931-41. Only 88 percent of the year-to-year changes in the revised December production estimate is associated with year-to-year changes in the preliminary December estimate over the period 1939-53. This percentage is 95 percent for 1931-41.

Forecasts for peanuts indicate the correct direction of change in the crop more than 80 percent of the time, beginning with the first production forecast issued in August.

Regression analyses suggest the possibility of some statistical bias in the early-season forecasts. Based on data for either 1931-53 or 1939-53, regression coefficients of about 0.8 were indicated for the August, September, and October forecasts, but this coefficient increased to about 0.9 for the November forecast. Constant terms are uniformly positive, ranging from 30 to 58 million pounds. Four out of 7 regression coefficients differ significantly from 1 at the 5-percent probability level, but none of the constant terms differs significantly from zero. For 1944-53, regression coefficients for these months range from 0.9 to 1.2 and none of them differs significantly from 1. Constant terms all are positive and range from 54 to 110 million pounds. Only the latter differs significantly from zero. In view of these somewhat inconsistent results, use of these regression equations in connection with current forecasts is not recommended. Analysts may wish to make further tests as additional information becomes available.

Production Forecasts for Tung Nuts

Tung nuts normally are harvested from November through April, so that the December estimate of production is, in effect, an early-season forecast. The first estimate or forecast of production is given in the annual December summary, and this is revised in a special report for tree nuts 10/ issued in the following August after a complete survey of processing mills. A revised estimate appears in the crop production report for the following December, but this figure normally differs by only a negligible quantity from that published in August, as crushing for oil is the single utilization for the nuts. Data on production of tung nuts are available beginning with 1939, but a preliminary December figure was first issued in 1944. Because of the nature of the reports for tung nuts, only the standard deviation for the difference between the preliminary and revised December estimates was computed. The standard deviation for 1944-54 is 14,000 tons, or about 20 percent of the average crop. The preliminary December forecast is associated with 84 percent of the year-to-year variation in the final production estimates.

10/ Tree Nuts: Production, Farm Disposition, Value and Utilization of Sales.

Production Forecasts for Fats and Oils

In each outlook issue of The Fats and Oils Situation, normally published in October, a table is carried giving production forecasts for major individual fats and oils for the current marketing year beginning October 1. These forecasts relate to production of fats and oils from domestic materials, and include in the production estimates the oil equivalent of domestic oilseeds to be exported. These forecasts are revised later, usually in the January issue of the Situation report. The forecasts for vegetable oils published in October are based largely on the October crop report; other sources of information are used for the animal fats. Subtotals are shown in the tables for edible animal fats (chiefly butter and lard), edible vegetable oils, soap fats, and drying oils.

In this report, we discuss analyses for butter, lard, edible vegetable oils, soap fats, drying oils, and total fats and oils for years beginning October, 1950-53. As for analyses of demand factors, our results are based on data available for a short period, and give only a general idea of the existing relationships between the variables studied. Moreover these years were exceptionally difficult to forecast because of the effect of several Government programs on the fats and oils economy.

As previously indicated, standard deviations can be used to study the way in which early-season forecasts differ from final estimates. They are shown in table 4 for the several fat and oil items, both in terms of million pounds and as a percentage of average production. In terms of percentages, differences between forecasts and actual output were relatively small for lard, total edible vegetable oils, and total fats and oils, but relatively large for the drying oils in both the October and January forecasts.

Another way to study the usefulness of the early-season production forecasts is in terms of percentage of variation of year-to-year changes in production that could be forecast by making use of them. Results from this method of analysis are much different from those based on relative standard deviations because of differences in the year-to-year variability of the several series. Production of total edible vegetable oils and of all fats and oils was relatively stable from year-to-year for the years included in this analysis, so that a small error in estimating the absolute level of output corresponds to a large percentage error in terms of year-to-year changes. Drying oils, on the other hand, varied greatly from year to year, so that a relatively large error of forecast in level is small in relation to the year-to-year variation.

In terms of year-to-year changes, over 95 percent of the variation in production of lard could be forecast by using either October or January figures. Drying oils, dominated by linseed oil, gave results that were almost as good. For these oils, about 85 percent of the year-to-year variation in the final figure was accounted for by the October forecast, and this percentage increased to more than 95 percent for the January forecast. For butter, less than 50 percent of the variation in the final figure is associated with the October forecast, but this increases to more than 95 percent for the January figure.

The total for edible vegetable oils is made up chiefly of soybean and cottonseed oils. For both cotton and soybeans, more than 90 percent of the year-to-year variation in production is associated with the October forecast issued by the Crop Reporting Board. For the years included in this analysis, however, less than 50 percent of the year-to-year variation in production of total edible vegetable oils is accounted for by the forecasts issued in October and January. The lower percentage for production of oil than for production of the raw materials results partly from the fact that uses for purposes other than crushing and export are fairly stable, so that differences between the forecast of the size of the crop and the final figure has a greater effect, percentagewise, on production of the oil. Other contributing factors arise from difficulties of forecasting (1) carryover of soybeans and cottonseed, (2) uses for the raw materials for purposes other than crushing or export, and (3) year-to-year variations in the yield of oil per unit crushed. Problems of forecasting production of the less important edible oils, such as peanut and corn oil, also contribute to the standard deviation of the differences for this total. A further and important factor is that, for these years, year-to-year changes in production of vegetable oils were much smaller than normal.

Little is known about the factors that affect year-to-year changes in production of inedible tallow and grease, the chief component of the total for soap fats. This is reflected in the low degree of relationship for this item. The percentage of associated variation was less than 25 percent for both October and January.

In some series, errors in forecast for the components are essentially unrelated. When this is true, they tend to offset each other and the total generally can be forecast with greater accuracy than the components. For other series, errors tend to cumulate and are larger for the total than for any one of the components. This appears to be the case for fats and oils. For the years used in this analysis, use of total production in the previous year as a forecast for the current year would have resulted in a more accurate estimate for the total than that obtained by adding together the separate forecasts for the components. However, for 1931-53, year-to-year variations in production of total fats and oils averaged 7 percent of the actual average production for the period (see table 4) as contrasted with 2 percent for the years 1950-53. Hence, with a more normal degree of year-to-year variation, the forecasts would be expected to be a useful guide as to the probable level of production in the current year.

By comparing the last and third from last columns in table 4, it is seen that during 1931-53, production, on a year-to-year basis, was considerably more variable than in 1950-53 for lard, edible vegetable oils, and total fats and oils, and considerably less variable for butter. Forecasts of year-to-year changes under normal conditions would tend to be more accurate than they were for 1950-53 for those series for which the long-term variability is larger than it was in 1950-53.

Estimates of Season-Average Prices

Nature of Estimates.--Two sets of estimates of season-average prices for the United States are published and successively revised. 11/ Essentially, these represent estimates of the season-average price received by farmers in individual States, weighted by estimated quantities (1) produced and (2) sold to derive average prices for the country for the crop year. The estimates include allowances for quantities bought by the Government under purchase agreements and loan quantities unredeemed (and therefore considered sold to the Government) at the end of the crop marketing season. The first estimate of the season-average price weighted by production is published in December following harvest and revised the following December. 12/ In May following harvest of a crop, an estimate of the season-average price weighted by sales is published; this is revised a year later. Each of these series is again revised when census data on production and sales become available. From time to time, longer term revisions are made. Most long-term revisions and those revisions made following the census result from revised production and sales weights. The research analyst has some interest in knowing the extent to which these several estimates are correlated and the extent to which they differ from a simple average of United States prices for the months involved in a particular marketing year. As for the production analyses discussed previously, these successive estimates are referred to as "preliminary," "revised," and "final" estimates.

Periods covered in analyses of data on prices vary because of a lack of comparable data for some of the series involved. For example, before 1935 prices published in the December report applied only to December 1. To make possible reasonably consistent comparsons, most analyses cover the period 1940-53. In the case of commodities for which the series involved can be extended back considerably beyond 1940, additional analyses are run covering these longer periods.

11/ Estimates of prices issued in December are taken from Season-Average Prices and Value of Production; those issued in May are taken from Farm Production, Disposition and Value of Field and Seed Crops. These publications are released by the Crop Reporting Board annually in these months.

12/ Beginning in 1955, a revision of this figure is included in a footnote in the May report.

Percentage of Year-to-Year Changes in Prices Associated With Earlier Estimates of Prices.-- In connection with the several available estimates of season-average prices, the analyst chiefly is interested in the extent to which one series can be substituted for another as a measure of year-to-year change, as the series are published at different times. Pertinent data are shown in table 5. For flaxseed, abnormal changes occurred in 1946 and 1947, when price controls were lifted; therefore, these years were eliminated in the flaxseed analyses. Abnormal changes in these years for other items did not appear to affect the relationships significantly.

Generally speaking, the time at which a crop is marketed is a major factor affecting the degree of association found between year-to-year changes in the several price series. The percentages of associated variation for flaxseed and cottonseed are high in all cases, because most of each crop is marketed by December. On the other hand, soybean and peanut marketings have not progressed so far by December; hence, the preliminary December estimate of the season-average price tends to vary considerably from later estimates. Little is known about the season-average price for tung nuts in December, as harvesting frequently continues through the following April.

The first two lines of table 5 show percentage relationships between year-to-year changes in final estimates of season-average prices weighted by production and simple averages for months in the marketing year. For soybeans, flaxseed, and peanuts, the degree of association is higher for the longer of the two periods studied. For cottonseed, the percentage of variation associated is the same for both periods. In no case is a simple average price a good indicator of the season-average price. The other lines in the table present percentage relationships between preliminary weighted average prices and averages published at a later date.

For example, an analyst might wish to know how well the price weighted by production issued in December would estimate the price weighted by sales issued in the following May. This comparison is shown in line 4. For flaxseed and cottonseed the relationship is close; it is not quite so close for soybeans and peanuts. The relationship existing between the preliminary December estimate and the revised figure published a year later was of importance before 1955, when revisions similarly weighted began to be issued in May. With the exception of tung nuts, as shown in line 5, the year-to-year changes in the preliminary December estimate are associated with not less than 96 percent of the year-to-year changes in the revised December estimate. For tung nuts, this figure is 60 percent.

When the revised December figure is issued, the analyst has a choice of using this to estimate the revised May figure or of using the preliminary

May figure. Data that relate to comparisons of this sort are shown in the last two lines. Here the percentages suggest that for most of the crops shown the revised December estimate is somewhat preferable to the preliminary May estimate for this purpose. For cottonseed, production and sales are assumed to be the same; thus the two prices series are interchangeable.

A comparison of the degree of correlation between the revised May and the revised December figure indicates the extent to which weighting data for individual States by (1) production and (2) sales makes a difference in the end result. This comparison is shown in the next to the last line. For all commodities included in this analysis, the difference is negligible.

The analysis between year-to-year changes in the final estimates of season-average prices weighted by production and the revised December estimates indicates that changes normally are negligible when census data are used for weighting purposes. This is shown in line 3 of the table.

Table 1.- Production of oilseed crops: Standard deviations of differences between December estimates and early-season forecasts and of year-to-year changes 1/

Item and period	Flaxseed						Soybeans									
	1912-54		1925-54		1936-54		1929-54		1936-54		1939-54		1942-54		1950-54	
	Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation	
	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/
	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.	Mil.bu.	Pct.
Difference between-- Preliminary December estimate and forecast in--																
July	4.0	18	4.4	17	4.5	15	---	---	---	---	---	---	---	---	---	---
August	3.0	14	3.3	13	3.6	12	---	---	---	---	---	---	18	8	27	10
September	2.0	9	2.1	8	2.3	7	---	---	11	6	12	6	13	6	14	5
October	1.7	8	1.6	6	1.7	6	---	---	8	4	8	4	8	3	4	2
November	---	---	---	---	---	---	4	3	5	3	5	3	5	2	3	1
Revised December 3/	.9	4	.9	4	.9	3	6	5	7	4	8	4	9	4	4	2
	1912-49		1925-49		1936-49		1929-49		1936-49		1939-49		1942-49			
Revised December and final estimate	.8	4	.6	2	.6	2	2	2	2	1	2	1	2	1	---	---
Year-to-year change in final estimate	9.5	43	10.6	42	13.1	42	22	16	26	15	28	14	31	13	---	---

	Peanuts						Cotton					
	1931-54		1939-54		1943-54		1915-54		1925-54		1936-54	
	Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation		Standard deviation	
	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/	Actual	Percentage 2/
	Mil.lb.	Pct.	Mil.lb.	Pct.	Mil.lb.	Pct.	Mil.bales	Pct.	Mil.bales	Pct.	Mil.bales	Pct.
Difference between-- Preliminary December estimate and forecast in--												
July	---	---	---	---	---	---	---	---	---	---	---	---
August	---	---	215	11	232	12	1.2	9	1.2	9	1.2	9
September	167	10	197	11	187	10	1.1	9	1.1	8	1.1	9
October	154	10	184	10	170	9	.7	6	.7	5	.7	5
November	111	7	135	7	124	6	---	---	.3	2	.3	2
Revised July	---	---	---	---	118	6	4/.2	2	4/.2	2	4/.2	2
Revised December 3/	113	7	134	7	---	---	---	---	---	---	---	---
	1931-49		1939-49		1943-49							
Revised July and revised December	---	---	---	---	10	1	---	---	---	---	---	---
Revised December and final estimate	47	3	17	1	11	1	---	---	---	---	---	---
Year-to-year change in final estimate	274	17	341	18	209	11	3.0	23	3.2	24	3.4	26

1/ Standard deviations measure the scatter or dispersion about an average; the average plus or minus one standard deviation ordinarily includes about 2/3 of the observations.

2/ Standard deviation expressed as a percentage of average crop reported in December following. For cotton, average of crop reported in May following.

3/ Periods end 1953.

4/ Difference between preliminary December and final ginnings reported in May following.

Table 2.- Production of oilseed crops: Percentage of variation in year-to-year changes in specified estimates associated with specified early-season forecasts 1/

Item and period	Flaxseed			Soybeans		Peanuts			Cotton			Cottonseed		Tung nuts
	1912-53	1925-53	1936-53	1929-53	1942-53	1931-53	1939-53	1944-53 2/	1916-54	1925-54	1936-54	1925-54	1936-54	1944-53
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Change in preliminary December estimate associated with change in--														
Acreage intentions based on estimated acreage-														
Planted	---	---	3/70	---	4/33	---	53	---	---	---	---	---	---	---
Harvested	---	---	3/78	---	---	---	---	---	---	---	---	---	---	---
Acreage in cultivation on July 1 based on estimated acreage--														
Planted	---	---	---	---	---	---	---	---	60	59	76	---	---	---
Harvested	---	---	---	---	---	---	---	---	64	64	78	---	---	---
Production forecast in--														
July	82	82	87	---	---	---	---	---	---	---	---	---	---	---
August	90	90	91	---	78	---	84	55	85	88	88	---	---	---
September	96	95	96	---	89	85	86	68	89	89	90	---	---	---
October	97	97	98	---	97	86	87	71	95	96	96	---	---	---
November	---	---	---	98	98	90	91	86	5/99.1	99.1	99.2	---	---	---
Change in revised July estimate associated with preliminary December	---	---	---	---	---	---	---	96	6/99.3	6/99.5	6/99.8	6/99.1	6/99.3	---
Change in revised December estimate associated with--														
Preliminary December	97	97	97	95	95	87	88	---	---	---	---	---	---	84
Revised July	---	---	---	----	---	---	---	99.7	---	---	---	---	---	---
	1912-49	1925-49	1936-49	1929-49	1942-49	1931-49	1939-49	1944-49						
Change in final estimate associated with revised estimate	99.0	99.6	99.7	99.2	99.4	97.6	99.6	99.5						

1/ See text for exact variables used. 2/ Relationships for peanuts were affected during World War II and the post-war period by certain Government programs. (See text.) A percentage of 90-95 percent appears more reasonable for months beginning with September for the crop of 1954 and subsequent years. 3/ Period begins with 1937. 4/ Period begins with 1936. 5/ Period begins with 1923. No forecast published in November prior to this date. 6/ Change in estimate of May following associated with preliminary December.

Table 3.- Oilseed crops: Probabilities of predicting correct direction in year-to-year changes in production from year-to-year changes in early-season forecasts 1/

Item	Flaxseed		Soybeans		Peanuts		Cotton	
	1912-53		1942-53		1931-53 2/		1916-54	
	Actual	Expected 3/	Actual	Expected 3/	Actual	Expected 3/	Actual	Expected 3/
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Changes in-								
Acreage intentions based on estimated acreage-								
Planted	4/82	82	4/56	70	5/47	76	4/84	84
Harvested	4/82	84	---	---	---	---	4/79	85
Production forecast in-								
July	90	86	---	---	---	---	---	---
August	95	90	58	84	5/87	87	79	87
September	98	93	75	90	87	88	82	89
October	98	94	83	95	87	88	97	93
November	---	---	6/92	95	87	89	7/100	97

1/ See text for exact variables used.
2/ Higher figures would be given based on 1931-41. (See text.)
3/ Based on a mathematical formula that makes use of the correlations shown in table 2.
4/ Period begins with 1936. Data for cotton relate to acreage in cultivation July 1.
5/ Period begins with 1939.
6/ Period begins with 1929.
7/ Period begins with 1923. No forecast published in November prior to this date.

Table 4.- Production of specified fats and oils: Standard deviations of differences between final estimates and forecasts, 1950-53, and of year-to-year changes, 1950-53 and 1931-53

Item	Forecast issued in - -				Year-to-year change in actual production based on - -			
	October		January		1950-53		1931-53	
	Standard deviation		Standard deviation		Standard deviation		Standard deviation	
	Actual	Percentage 1/ 2/	Actual	Percentage 1/ 2/	Actual	Percentage 1/ 2/	Actual	Percentage 1/ 3/
	Million pounds	Percent	Million pounds	Percent	Million pounds	Percent	Million pounds	Percent
Butter	165	11	103	7	182	12	141	7
Lard	68	3	56	2	287	11	382	17
Total edible vegetable oils	293	6	129	3	111	2	339	12
Total soap fats	223	9	201	8	209	8	158	9
Total drying oils	132	18	110	15	226	31	168	35
Total fats and oils	667	5	453	4	247	2	696	7

1/ Standard deviation expressed as a percentage of average production.
2/ Based on actual production, 1950-53.
3/ Based on actual production, 1931-53.

Table 5.-- Season average price for oilseed crops: Percentage of variation in year-to-year changes associated with specified early estimates 1/

Period and item	Flax-seed	Soy-beans	Pea-nuts	Cotton-seed 2/	Tung nuts
	Pct.	Pct.	Pct.	Pct.	Pct.
1910-53:					
Final figure weighted by production associated with--					
Simple average price	92	3/84	94	91	---
1940-53:					
Final figure weighted by production associated with--					
Simple average price	88	75	84	91	---
Revised December	99.9	99.9	99.5	99.9	---
Preliminary May estimate associated with--					
Preliminary December	99.4	98	97	99.9	---
Revised December estimate associated with--					
Preliminary December	99.2	96	97	99.9	60
Revised May estimate associated with--					
Revised December	99.9	99.9	99.5	99.9	---
Preliminary May	99.5	99.0	99.0	99.9	---

1/ See text for exact variables used.
2/ Periods studied were 1910-54 and 1940-54.
3/ Period begins with 1925.